

OIL AND GAS DOCKET NO. 09-0267018

THE APPLICATION OF QUICKSILVER RESOURCES, INC. TO DISPOSE OF OIL AND GAS WASTE BY INJECTION INTO A RESERVOIR NOT PRODUCTIVE OF OIL OR GAS, STATION BRANCH RANCH SWD LEASE WELL NO. 1, NEWARK, EAST (BARNETT SHALE) FIELD, HOOD COUNTY, TEXAS

HEARD BY: Andres J. Trevino P.E., Technical Examiner
Christopher S. Hotchkiss, Hearings Examiner

APPEARANCES:

APPLICANT:

Philip Whitworth, Attorney
Mark Hanna, Attorney
Rick Johnston, P.E.
Jon Huggins
Brad Boothe

REPRESENTING:

Quicksilver Resources, Inc.

PROTESTANTS:

Craig Stevenson
Derinda Stevenson

Self
Self

PROCEDURAL HISTORY

Application Filed:	August 13, 2010
Request for Hearing:	July 28, 2010
Notice of Hearing:	September 10, 2010
Date of Hearing:	October 26, 2010
Transcript Received:	November 8, 2010
Proposal For Decision Issued:	March 25, 2011

EXAMINERS' REPORT AND PROPOSAL FOR DECISION

STATEMENT OF THE CASE

Quicksilver Resources, Inc. ("Quicksilver") requests authority pursuant to Statewide Rule 9 to dispose of oil and gas waste in its Station Branch Ranch SWD No. 1 in Hood County. The well will be a non commercial disposal well and will be used solely for the

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disposal of oil and gas waste from Quicksilver's development of Barnett Shale wells in the area.

This application was protested by Craig and Derinda Stevenson, adjacent landowners. The Stevensons are concerned over truck traffic and potential water well contamination the proposed disposal well may cause.

DISCUSSION OF THE EVIDENCE

Applicant's Evidence and Position

The subject well was drilled in March 2008 as a planned future injection well for Quicksilver's surrounding Station Branch Ranch Barnett Shale wells. The location for the proposed well is approximately 2.9 miles southeast of the town of Acton. Quicksilver operates 12 producing wells in the immediate area that will be serviced by the proposed disposal well. The wells produce about 500 barrels of water per day. Currently the water is trucked to Quicksilver's Taylor well 2¼ miles away.

The proposed Station Branch Ranch SWD No. 1 is drilled to a depth of 7,920 feet, which is 1,760 feet into the Ellenburger section. The well has 795 feet of 9⅝" surface casing with cement circulated from the casing shoe to the ground surface, and 5½" casing set at 7,920 feet. (See Quicksilver Exh. No. 4 Wellbore Diagram attachment). Quicksilver set two DV tools in the well to ensure cement was circulated through the majority of the casing. A deep DV tool was set at the bottom of the well to cement the well after lost circulation problems were encountered while drilling the well. A second DV tool was set at a depth of 4,822 feet. Two cement slurry runs with a total volume of 845 sacks of cement were used to cement above the DV tool. A cement bond log indicates the top of cement behind the longstring is found at a depth of 830 feet. The cement bond log also indicates good cement bonding from 7,920 feet to 830 feet. The Texas Commission on Environmental Quality recommends that usable-quality ground water be protected to a depth 20 feet below the base of the Cretaceous-age beds, which is expected to occur at 700 feet. TCEQ therefore recommends that surface casing be set to a depth of at least 720 feet. As noted above, Quicksilver has set casing to a depth of 795 feet.

The log of the Station Branch Ranch SWD No. 1 well indicates the existence of a 2,905 foot shale interval found from 1,800 feet to 4,705 feet. The shale interval begins at the top of the Atoka formation to the top of the Bend Conglomerate. The shale interval will act as a barrier to any vertical migration of fluids that are injected below the shale. The log further depicts a 1,000 foot tight limestone interval near the top of the Ellenburger which will provide an impervious barrier to the migration of injected fluids from the deeper disposal interval of the Ellenburger.

The proposed injection will be through 2⅞" tubing set on a packer at approximately 7,775 feet, but no higher than 100 feet above the top of the injection interval. The

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proposed injection interval is the lower portion of the Ellenburger formation between 7,821 and 7,920 feet. The base of the Barnett Shale is located approximately at 6,150 feet. The proposed maximum injection volume is 15,000 BWPD, with an estimated average of 6,500 BWPD. The proposed maximum injection pressure is 3,000 psig.

There are 18 wellbores within a ½ mile radius of the proposed disposal well. The wells are Quicksilver's horizontal wells completed in the Barnett Shale with the exception of four Burlington Resources Barnett Shale wells and one Williams Exploration Barnett Shale well. None of the wells have penetrated the Ellenburger. Currently, Quicksilver hauls about 500 barrels per day of produced water from its 12 Station Branch Ranch wells to its Taylor SWD No. 1. The well is about 2¼ miles to the north of the current Station Branch Ranch development in Hood County. Quicksilver plans to drill additional wells in the area in the future.

The proposed Station Branch Ranch SWD No. 1 is located in the middle of Quicksilver's Station Branch Ranch Barnett Shale development in Hood County. The proposed Station Branch Ranch SWD No. 1 will gather produced water from surrounding wells through a buried, corrosion proof poly plastic pipeline system. The surface facility will not be equipped to accept truck unloading. With the current 12 producing wells, the use of the Station Branch Ranch SWD No. 1 will save an estimated 10,600 miles of hauling per year. Additionally, Quicksilver plans to drill additional wells in the future. In addition to the near elimination of truck traffic, the use of the proposed disposal well will result in the recovery of additional reserves as a result of reduced operating expenses associated with the lesser costs of disposing water through a pipeline instead of trucking to the Taylor SWD No. 1. The estimated disposal costs for a barrel of produced saltwater through a pipeline is \$0.40 per barrel. The cost to dispose of that same barrel by trucking to the Taylor SWD facility is \$1.20 per barrel. With the 12 Station Branch Ranch wells producing 500 barrels of water per day and assuming \$3.50/MCF (gas price at the time) the economic limit for the wells is reduced from 6,949 Mcf/month to 2,316 Mcf/month. Assuming a 8% decline rate, the reduction in disposal costs will result in the recovery of an additional 694.9 MMCF of gas from the 12 Station Branch Ranch wells.

Notice of the subject application was published in the *Hood County News*, a newspaper of general circulation in Hood County, on May 8, 2010. A copy of the application was mailed on May 10, 2010 to the Hood County Clerk's Office and the offsetting operators. Burlington Resources and Williams Exploration are the only offsetting operators within ½ mile. An amended W-14 with more detail on the completion of the well and with the amended injection interval was mailed out to individuals on the service list on October 8, 2010 and notice was republished on October 6, 2010.

Protestants' Evidence and Position

Protestants Craig and Derinda Stevenson are concerned that the use of the proposed disposal well will have adverse impact on fresh water wells in the area. The Stevensons live within the 2½ mile radius of the proposed well and use a fresh water well for domestic use. Craig Stevenson stated the majority of residences (approximately 80%)

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in the area use water wells for domestic use. He stated he and area residents are concerned their water wells will be contaminated as a result of a failure of the casing in the injection well. Mr Stevenson acknowledged that the injection well has surface casing set through the area groundwater found at a depth of 250 to 320 feet for the Paluxy and 400 to 800 feet in the Trinity aquifer. Mr. Stevenson stated many of the area residents had their well water tested to establish a background sample to compare with future well water samples should the groundwater become contaminated.

Mr Stevenson also expressed concern regarding the existing truck traffic in the area. He is concerned Highway 4, which is currently used by area water haulers, is too narrow for truck traffic. He stated Highway 4 is a two lane road with little to no shoulders to allow trucks to safely pull over. Mr Stevenson acknowledged during the hearing that approving the application would reduce truck traffic.

The application file contains several protest letters from individuals living in the area expressing concerns with the Station Branch Ranch SWD No. 1 disposal well. All expressed concerns of possible ground water contamination as a result of the operation of the proposed disposal well. Other concerns raised were increasing truck traffic and decreasing property values.

EXAMINERS' OPINION

The examiners recommend that this application be approved. The Station Branch Ranch SWD No. 1 is completed in a manner which will confine disposal fluids to the proposed disposal interval in the lower portion of the Ellenburger. The longstring casing is cemented from total depth of 7,920 feet up to a depth of 830 feet to prevent migration from the injection interval. Additionally, Quicksilver proposes to use only the lower section of the Ellenburger, below a tight interval of the Ellenburger for disposal. Injecting below the 1,000 foot tight limestone section near the top of the Ellenburger will further prevent migration of disposal fluids out of the Ellenburger. With a gross thickness of approximately 1,770 feet in the Ellenburger, more than 1,670 feet of Ellenburger formation will separate the proposed disposal interval from the Barnett Shale. There are no wellbores which penetrate the proposed disposal interval, within one mile of the proposed disposal well. The produced saltwater from Quicksilver's area gas wells will be transported to the Station Branch Ranch SWD No. 1 by a poly plastic pipeline system nearly eliminating truck traffic.

Approval of the requested permit is in the public interest given the that approval of the disposal permit will nearly eliminate truck traffic. Truck traffic is an issue over which the Railroad Commission lacks jurisdiction but over which the protestant expressed concerns. With the production of salt water an unavoidable byproduct of natural gas production of wells in the area, disposal facilities like the proposed well are necessary to fully develop and prevent waste of the natural gas reserves in Hood County. Use of the Station Branch Ranch SWD No. 1 will nearly eliminate trucking costs, which will reduce the disposal costs for produced water and increase the economic life span of the Barnett Shale wells. This will result in the recovery of additional reserves in Station Branch Ranch wells of 57.8

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MMCF per well. Applied to the 12 Station Branch Ranch wells, this proposed disposal facility will allow the recovery of an additional 694 MMCF of natural gas.

The evidence further indicates that the operation of the subject disposal well will not adversely impact usable quality water. Surface casing has been set at 795 feet and cemented to surface. This is approximately 75 feet deeper than the base of usable quality water as recognized by the TCEQ. There are additional shale layers above the Barnett Shale identified on the well's log that will further confine any injected fluids from reaching the protected ground water. The Atoka formation is approximately 2,900 feet thick of impervious shale.

Quicksilver noted that its operations will actually reduce truck traffic due to the use of the poly plastic pipeline system to gather produced salt water from existing and future Quicksilver's Barnett Shale wells in Station Branch Ranch area. Quicksilver's surface facility at the Station Branch Ranch SWD No. 1 will not have a truck unloading station at the site making unloading truck transported saltwater impossible.

Based on the record in this docket, the examiners recommend adoption of the following Findings of Fact and Conclusions of Law:

FINDINGS OF FACT

1. Notice of this hearing was given to all persons entitled to notice at least ten (10) days prior to the hearing. Notice of the application was published in the *Hood County News*, a newspaper of general circulation in Hood County, on May 8, 2010 and October 6, 2010.
2. Quicksilver Resources, Inc. drilled the Station Branch Ranch SWD No. 1 in March 2008 as a planned future injection well for Quicksilver's surrounding Station Branch Ranch Barnett Shale wells.
3. The maximum requested injection volume is 15,000 barrels of water per day and the maximum requested surface injection pressure is 3,000 psi. The requested disposal interval is the lower portion of the Ellenburger formation between 7,821 and 7,920 feet.
4. The Station Branch Ranch SWD No. 1 is cased and cemented in a manner to protect usable quality water.
 - a. The Texas Commission on Environmental Quality recommends that usable-quality water be protected to 720 feet in the area of the proposed well.
 - b. The subject well has 795 feet of 9 $\frac{5}{8}$ " surface casing cemented to surface.
5. Fluids injected into the Station Branch Ranch SWD No. 1 will be confined to the

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injection interval.

- a. Injection will be through tubing set on a packer no higher than 100 feet above the top of the injection interval.
 - b. The subject well has 5½" casing set at 7,920 feet, 1,760 feet below the top of the Ellenburger. The top of cement behind the 5½" casing is 830 feet based on a cement bond log.
 - c. The log of the Station Branch Ranch SWD No. 1 well indicates the existence of a 2,905 foot shale interval found from 1,800 feet to 4,705 feet. The shale interval will act as a barrier to any vertical migration of fluids that are injected below this shale.
 - d. Injection will be in the lower section of the Ellenburger. There is a confining "tight" 1,000 foot thick limestone section in the upper Ellenburger.
 - e. With a maximum surface injection pressure of 3,000 psi, the pressure is below the .5 psi/ft pressure gradient standard.
6. Approximately 80% of the residences in the area use groundwater wells for domestic use. Many residences have tested their groundwater to establish a background sample.
7. The approval of the Station Branch Ranch SWD No. 1 facility will nearly eliminate truck traffic, will reduce disposal expenses and the threat of spills associated with Quicksilver's Station Branch Ranch Barnett Shale wells.
 - a. Currently water produced from the Station Branch Ranch wells is trucked to Quicksilver's Taylor SWD Well No. 1.
 - b. Produced water from the Station Branch Ranch wells will be gathered and transported to the Station Branch Ranch SWD No. 1 by poly plastic lines.
 - c. The surface facilities at the Station Branch Ranch SWD No. 1 will not be equipped to allow water truck unloading.
 - d. The water gathering pipeline system will reduce truck traffic by 10,600 miles per year based on current water production of 500 BWPD and will decrease disposal expenses and the threat of spills.
8. There are no wellbores within one mile of the proposed disposal well which penetrate the proposed disposal interval.
9. Use of the Station Branch Ranch SWD No. 1 Well as a disposal well is in the public

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interest to promote the active development of the Barnett Shale.

- a. Use of the well will provide a safe, economic means of disposal of the fluids associated with production.
 - b. Use of the well will result in the near elimination of potential spills associated with hauling of disposal fluids from surrounding Quicksilver producing wells to other facilities.
 - c. Use of the well will result in the recovery of an additional 694 MMCF of gas from the 12 wells operated by Quicksilver due to a lower economic limit for wells.
10. The use or installation of the proposed injection well will not endanger or injure any oil, gas, or other mineral formation.
 11. With proper safeguards, as provided by terms and conditions in the attached final order which are incorporated herein by reference, groundwater will be adequately protected from pollution.

CONCLUSIONS OF LAW

1. Proper notice was issued in accordance with the applicable statutory and regulatory requirements.
2. All things have occurred to give the Railroad Commission jurisdiction to consider this matter.
3. The use or installation of the proposed injection well is in the public interest.
4. Quicksilver Resources, Inc. has made a satisfactory showing of financial responsibility to the extent required by Section 27.073 of the Texas Water Code.
5. Quicksilver Resources, Inc. has met its burden of proof and satisfied the requirements of Chapter 27 of the Texas Water Code, Section 27.051 and the Railroad Commission's Statewide Rule 9.

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EXAMINERS' RECOMMENDATION

Based on the above findings and conclusions, the examiners recommend that the application be approved as set out in the attached Final Order.

Respectfully submitted,

Andres J. Trevino P.E.
Technical Examiner

Christopher S. Hotchkiss
Hearings Examiner